implementation of Part 68 and Part 15 had provided useful insights into the kinds of impacts the proposed Guidelines are likely to have on manufacturers.

Our first application of the surrogates is to estimate a lower bound on the number of firms and new model types that might be affected by the Guidelines. Turning first to the Part 68 data, in a typical year, the FCC estimated that it receives an average of approximately 2,400 Part 68 applications from approximately 800 firms.[29] Annual data, however, tend to under represent the large number of firms that introduce new products less often than annually. Morever, firms seeking Part 68 registration ("applicants") are usually those firms marketing the equipment in the United States, not necessarily those doing the manufacturing. It is not uncommon for each such marketing entity to rely on multiple manufacturers to supply its product; thus, the 800-applicant figure is much lower than the number of manufacturers affected by Part 68 requirements. If we instead consider data from the Commission's twenty years of operating the program and conservatively assume that the ratio of applicants to manufacturers remains constant, we can estimate that the 800 applicants relied on approximately 1,800 manufacturers, some of them vertically integrated, to produce their products.

Certification and type acceptance data for 1996 similarly show that approximately 1,500 firms applied for certification under Part 15 and other programs.[30]

As we have stated, Part 15 affects equipment capable of causing electromagnetic interference with radio frequencies, and Part 68 deals only in equipment that is to be directly connected to the PSTN. In contrast, our ultimate purpose is to gauge the level of economic activity affected by the Board's Section 255 Guidelines, which address the accessibility of all telecommunications and customer premises equipment. How valid a surrogate are Part 15 and Part 68 models?

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[29] Statistics regarding the FCC's Part 15 and Part 68 programs were provided by the FCC.

[30] The vast bulk of these applications are for equipment under Part 15, but other programs represented in smaller numbers included Parts 18, 22, 74, 80, and 90. Also, since August 1996 the FCC has also run a self-certification program, causing some large number of applications and manufacturers to "disappear" from the Part 15 statistics.

Part 15 and Part 68 models likely represent a very conservative lower bound for purposes of gauging costs of compliance under the proposed Guidelines. Most Section 255-affected equipment does not connect directly to the PSTN. Indeed, for any connection to the PSTN via a Part 68-affected device, there will likely be many multiples of Section 255-equipment types that will use that device to connect to the PSTN. Thus, the number of model types that would be affected by the Guidelines (each corresponding to a thread of some length through the new product development path) would likely be some large multiple of the number of equipment model types affected by Part 68.

A survey of 1996-type acceptances and certifications under Part 15 reveals that nearly half of the applications centered on computer or computer peripheral equipment. In a day when nearly every computing device sold is capable of connection directly or indirectly to other computers, it is difficult to believe that these devices and those connected to them will not fall within the ambit of Section 255. However, in order to generate a conservative lower bound, we culled the 1996 data to include only applications falling within Equipment Class Descriptions that might include pagers, cordless telephones, and other equipment of an ambiguously classical telecommunications nature. Of the 66 Equipment Classes represented in the 1996 data, we chose only applications falling within the following categories:

Telecommunications Equipment Classes			
Class	**Description**	**Class**	**Description**
CXX	Communications Receiver	PCE	Nonbroadcast Transmitter
CYY	Low-Power Communications Device Receiver	PCF	Nonbroadcast Transmitter
DSS	Spread Spectrum Transmitter	PCT	Nonbroadcast Transmitter
DXC	Low-Power Transceiver, Rx Certified	PUB	Unlicensed PCS Transmitter
DXT	Low-Power Transceiver, Rx Verified	PUE	Unlicensed PCS Transmitter
DXX	Low-Power Communication Device Transmitter	PUT	Unlicensed PCS Transmitter
ETB	Cordless Telephone Base Transceiver	TNB	Nonbroadcast Transmitter
ETR	Cordless Telephone Remote Transceiver	TNE	Nonbroadcast Transmitter
ETS	Cordless Telephone System	TNF	Nonbroadcast Transmitter
PCB	Nonbroadcast Transmitter	TNT	Nonbroadcast Transmitter

This has the net effect of reducing the 9,218 total 1996 applications in our pool to approximately 2,500. Viewing the Part 68 and Part 15 as a whole and ignoring (once again, with conservative effect) that equipment in one may not necessarily fall in the other, we can model annual new product output in the United States for telecommunications equipment as 2,500 new product introductions per year from, for the sake of argument, 1,200 manufacturers. Of course, there are many telecommunications products that do not require Part 15 or Part 68 certification (*e.g.*, web browser software or a central office voice mail module). Consequently we know that the above count significantly underestimates the number of products affected by a substantial factor — probably somewhere in the range of two to five.

Notice that our two estimates are consonant — the count of FCC activities of 2,500 products per year (a count that must miss many products is biased low) and the estimate of 6,500 products per year based upon industry sales — fit together reasonably well.

3. Modeling Compliance Costs

At a minimum, the proposed Guidelines envision a regime in which the Access Board maintains a constantly lengthening checklist of performance parameters for device inputs and outputs. The prudent manufacturer would have little choice but to respond to these requirements by establishing a cadre of lawyers and regulatory experts to follow the constantly shifting standards, represent the company's interests in the ongoing process, and ensure that new standards are implemented within the firm. A test laboratory would also need to be established, with engineers versed in the science behind each new standard, to test each final model for compliance. We now turn our attention to gauging these more formal costs of complying with the proposed Guidelines.

The annual costs associated with Part 68 and Part 15 compliance are significant. The FCC itself, which merely has to test these final products for compliance against well-established technical standards using a stable base of equipment, has a laboratory of 35 employees with a $2 million annual budget. It is not surprising that manufacturers, who must actually design, develop, and manufacturer the equipment in compliance with these standards, spend several times more per year. One large, vertically integrated manufacturer we interviewed designs, develops, and manufactures over 100 new U.S. product models a year. It estimated that the formal aspects of Part 68 and Part 15 compliance and the associated engineering and regulatory activity require 50 full-time staff equivalents combined with $50 million worth of lab equipment. This works out to about $50,000 per product approved. If same cost applied to all 5,000 products affected by the Guidelines, the cost would total $250 million per year.

How suitable are these Part 68 and Part 15 data as a surrogate for compliance costs under the Guidelines as contemplated? As we have already observed, Part 68 and Part 15 compliance is based on a compact, well-defined engineering problem expressed in terms of established technology and administered according to stable, well-established law and regulations. The compliance effort suggested by the Guidelines is likely to be substantially larger. First, the problem is quite the opposite of compact: its is entirely open-ended. From the perspective of an engineer who must ultimately array physical and material phenomena in a single, well-defined way, there is no stable, objective, closed technical definition of disability, let alone such a definition of accessibility.

Indeed, there is no clear method of developing either. Second, the Guidelines contemplate a shifting, continually evolving body of requirements on manufacturers that, presumably, would closely follow the cutting edge of science and technology. Third, the vague yet mandatory decision-making dynamic envisioned by the Guidelines would be no help in establishing stability for these standards, but would instead be the opposite. A firm or group of firms that decide that an interface is acceptable if 8 of 10 of the disabled in the affected class can satisfactorily distinguish between two states of an output device would inevitably be challenged by complainants who believe that the appropriate standard should be 18 out of 20.

We developed a simple model that considers the development process to be divided into four stages:

- Research,
- Specification and Design,
- Prototyping, and
- Manufacturing Startup.

The model considers four different scales of projects:

- Simple repackaging of existing products,
- New models of existing products,
- Next generation of simple products or upgrades to complex products, and
- Major new technology platforms.

The model inputs consist of estimates, developed with industry experts, of the fraction of projects that fall into each category, the level of effort and duration of each of the four stages, and the percentage cost increase from compliance with the Guidelines at each of the four stages.

Our model predicts that the added costs of compliance will fall in the range of $450 to $750 million per year. Notice that this is comparable to the per product costs associated with Part 15 and Part 64 compliance.

4. Product-Specific Costs

Our focus has thus far been exclusively on process costs. To get a feel for direct effects on product prices from implementation of accessibility features, a few examples may suffice.

The FCC estimated that each year 25 million cordless telephones and another 25 million corded telephones are sold in the United States. Let us consider only the materials costs ultimately borne by the market of universal compliance with only two of the Guidelines' more conventional, well-defined requirements: the installation of a standard jack for interface to special peripheral equipment and the installation of a motor to allow for a vibrating alert mode. Standard jacks and associated circuitry are very well understood from an engineering viewpoint and might be added for a unit price of perhaps 50 cents. The motors and mechanical subassembly associated with vibrators — which, incidentally, require a good deal of engineering before the overall product can meet conventional product lifetime standards — might conceivably be had for $4.50 per unit, for a total of $5.00 per unit, yielding total cost in parts alone of a *quarter of a billion* dollars per year for simply these two of a manifold number of products potentially affected.

	Average Per Model	**Industry-wide**
Impacts on Product Development	$70,000 to $115,000	$450 M to $750 M
Illustrative Product Costs	$5.00 per unit	$250 M

5. Synopsis

Based on conservative assumptions, our analysis suggests that a lower bound estimate of compliance costs under the Access Board's approach could easily run to more than a billion dollars per year (see table above).

VII. ADVERSE CONSEQUENCES ON INNOVATION

The process that leads to conception of new products is stochastic and serendipitous; it is apparently not a highly rationalized, consistent process either within any given firm or across different firms. New ideas often appear to be generated almost randomly through a variety of means: customers

surveys, market research, and consumer feedback often provide pertinent input information; sometimes new product concepts are the result of individual brainstorming or grow out of laboratory research; and sometimes products are natural extensions of existing products. In some companies, development of new products is more systematized than in others, but, in general, ideas for new products are generated in many different ways. This is not a process easily amenable to rationalization for particular ends.

The vibrating pager provides a good example of a product that improves the well-being of persons with disabilities, but whose conception had little to do with conscious efforts to help persons with disabilities. It resulted from customer feedback indicating that people working in noisy environments were missing pages. These customers could not hear, not because of a disability, but because of the environment in which they worked. Engineers created a small vibrating device so that pagers could function effectively in noisy environments. As it turned out, the market for vibrating pagers turned out to be even larger. Many people want to be able to receive pages during business meetings and conferences without disturbing others. The market grew, and costs declined as economies of size were realized. Other new features and functions were also added (*e.g.*, alpha-numeric displays). The result is now a set of products that are economical to supply and purchase and help improve the well-being of some people with disabilities — a good result but one that was not the intended at the outset.

Thus, new technical capabilities primarily occur as a result of experimentation, trial, and error. In most markets, new product ideas are generally test marketed. Sometimes new products and processes are subjected to a full-scale market test and fail completely. Even failures, however, often produce valuable lessons. Successes and failures by some companies produce guideposts and examples for other companies besides the initial experimenters.

The approach embodied in the Guidelines promises to make experimentation and innovation more costly by raising development costs, increasing the number of criteria new products must satisfy, erecting regulatory barriers, and raising the amount of revenue a new product must generate. With the extra requirements and the likelihood of second-guessing and potential penalties, the costs and

risks associated with new product development would be increased well beyond those that already exist. The Guidelines may thus deter those very activities that are the main sources of product improvements and accessibility advances.

If the goal is discovery and enhancement of service features to meet the needs of persons with disabilities, a good approach should encourage *greater* experimentation and risk-taking to discover and deploy solutions. That is not to say that government should not require that particular needs be addressed, but the means sanctioned to address those needs should be conceived in a manner that holds the greatest promise of producing improvements. The main promise held out by the Accessibility Guidelines is for large amounts of documentation explaining why the desired objectives are not readily achievable and lengthy disputes over the issue of whether articulated rationales are sufficiently persuasive.

An approach to accessibility requirements that inhibits product innovation is likely doomed from the start. Such a tack is difficult to understand given the role innovation has historically played in generating advances in accessibility for persons with disabilities.

VIII. Why Building-Access Analogies Are Misleading

The literature on communications devices is replete with analogies to building access for those with disabilities. But, such analogies are fundamentally misleading. In almost all cases, access features in buildings advantage some while disadvantaging no one. My wheelchair ramp does not interfere with your visual alarm. Consider the following access features and how few they disadvantage:

- Door levers instead of round handles,
- Stalls in bathrooms,
- Lowered drinking fountains,
- Visual alarms,
- Ramps parallel to stairways,
- Elevators parallel to escalators, and
- Elevator labels in Braille.

In contrast, with telecommunications and information terminals and services there are many clear clashes of needs. Consider the following tradeoffs:

- Small keyboards versus big keyboards,
- Multiple modes versus cognitive complexity,[31]
- Portability and light weight versus size of display, and
- Point-and-click interfaces versus character-oriented controls.

Each choice between these pairs of design elements benefits one group of individuals with disabilities but disadvantages another group.

The readily affordable standard also differs. In a building, the primary determinant of affordability is construction cost. In contrast, there are multiple determinants of affordability for telecommunications equipment, including design costs, manufacturing costs, and lost sales. This third element, lost sales, necessarily has a subjective component. People differ in their opinions on whether or not consumers would accept a larger and more expensive pager with a larger display. Regulators are unlikely to be able to effectively and fairly review a firm's forecasts about the likely marketplace success of specific products.

To recapitulate, analogies from building access, where needs rarely conflict and the cost structure differs, are not necessarily applicable to telecommunications equipment and services access.

IX. AN ALTERNATIVE APPROACH

A. Flaws in the Proposed Approach

The approach embodied in the proposed Guidelines entails very specific proscription of compliance efforts in two important ways: (1) the Guidelines require efforts to make each and every product serve the needs of persons with disabilities, and (2) the Guidelines require efforts to make each product simultaneously meet the (sometimes conflicting) needs of persons with different

[31] Consider that complexity is a fundamental problem for all consumers today with modern information technology products.

disabilities. It is not a matter of trying to create a variety of specific products to meet the needs of persons with specific disabilities but rather of making every product capable of simultaneously meeting the accessibility needs of persons with different disabilities.

As we have remarked, this is not a strategy likely to produce improved equipment or service accessibility for persons with disabilities; instead it sets demanding marks for authentication efforts to document that equipment or serving arrangements capable of satisfying such disparate objectives are, in fact, not readily achievable. The requirements are probably impossible to achieve; therefore, compliance efforts would primarily consist of demonstrating and explaining why the requirements are not readily achievable in specific contexts. The result would likely be a process that is long on creation of paper trails and second-guessing but short on improved accessibility for persons with disabilities. Given the increased costs of and barriers to product innovation under the Guidelines, improvements in accessibility may well fall short of what might have occurred in the absence of changes in government policy. It may well be that the welfare of *all* consumers — disabled individuals included — would be significantly reduced on account of the reduced product innovation and higher production costs engendered by the added regulatory burdens.[32]

The Accessibility Guidelines do offer firms supplying equipment with the means (perhaps illusory) to comply with the statute's mandates. In particular, as long as firms can document why the requirements are not readily achievable, they may ostensibly be judged to be in compliance. This is a genuine benefit (although one different from the principal statutory objective of improving accessibility for persons with disabilities), but one that is likely purchased at a high cost. In particular, the added layers of compliance bureaucracy add costs but do not contribute to enhanced productivity in terms of improved accessibility. In addition, some means of statutory enforcement are required

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[32] As the Commission is well aware, delays in the introduction of telecommunications products and services that ultimately prove successful in the marketplace often entail very large consumer welfare losses. Different estimates of the costs of cellular delay, for example, put a value on the attendant consumer welfare losses in the tens of billions of dollars. *See* C.L. Jackson, T. Kelly and J.H. Rohlfs, *Estimate of the Loss to the United States Caused by the FCC's Delay in Licensing Cellular Telecommunications*, November 8, 1991 (revised) (regulatory delay in introduction of cellular service in the United States imposed $86 billion welfare loss on the economy); and J. Hausman, "Valuation and the Effect of Regulation on New Service in Telecommunications," November 1997 (welfare loss from cellular delay estimated at $31-49 billion).

and the government presumably needs some empirical basis on which to base findings about the scope and extent of compliance efforts and the statute's effectiveness in achieving its objectives.

Given the shortcomings in the approach embodied in the Accessibility Guidelines, the question naturally arises as to what would constitute a more reasonable alternative approach to achievement of statutory objectives in lieu of the approach embodied in the Guidelines? In our view, there are two important changes in the Guidelines that could produce significant improvements in their effectiveness, both in terms of increasing accessibility benefits for persons with disabilities and in terms of reducing deadweight compliance costs.

The first recommended change would entail abandonment of the unachievable objective of having each and every product equipped to meet each of the diverse needs of persons with disabilities. That approach is not only likely to prove ineffective in producing advances in accessibility, but also likely to impose higher costs on all consumers, including persons with disabilities.

The second change we would recommend is for the FCC to seek to ensure achievement of legislative objectives through a formal process of monitoring, reporting and review. The FCC has used this approach successfully in other contexts, and such an approach would be more in keeping with the reliance on market forces that generally characterizes the Telecommunications Act's informing philosophy. This is a case where, given the nature of the goals and the means likely to be available to achieve them, detailed proscriptive regulation seems almost bound to fail. At the same time, there is an immense reserve of good will available that can be exploited and directed toward the production of improved devices to address the accessibility needs of persons with disabilities. The government can play an important role in providing direction and guidance to ensure that such resources are productively deployed and genuine progress is achieved.

B. Solutions

We offer solutions to each of the separate problems — market failures, distributional concerns, and issues of appearances and recommend modifications to the Section 255 Guidelines.

Market failures have already been solved for telecoils. A reasonable case may be made that a market failure exists in the training of design staffs. Requirements that manufacturers institute programs for training their design staffs in principles of accessible design and in the needs of people with disabilities would also probably serve efficiency.

The problem of information failures at time of purchase can be addressed by requiring better marketing information and the availability of marketing information to those with disabilities. Both Section 255 and the Access Board's Guidelines address this problem. The problem of ensuring that retail staffs are properly trained is more difficult. The proposed rules reach the carriers and their marketing staffs but do not deal with the retail distribution of consumer electronics.

Distributional concerns associated with meeting the needs created by rare disabilities are unlikely to be met by regulation of manufacturers and service providers. Rather, various forms of direct subsidy are needed for such orphan conditions.

The problem associated with concerns about categorizing or stigmatizing those with disabilities appears difficult to solve. We are concerned that any attempt to solve this would result in a reduction in the solutions available to those with disabilities. Further, a successful solution would not eliminate the need for special solutions for many with disabilities. Reducing the supply of equipment explicitly designed to solve problems created by disabilities and reducing the marketing opportunities for such equipment might have the undesired result of reducing the supply of equipment to those with the less common disabilities and may also increase any negative images associated with specialized communications equipment.

C. Recommendations

We believe that incorporation of the following principals would serve both economic efficiency and the needs of persons with disabilities.

There should be separate treatment of consumer products, and products and services, such as payphones, where the consumer has a less direct voice in equipment selection. In this case regulations of telecommunications service providers would usually suffice to ensure that the goals are met.

Consumer products should be subject to a "choice principal." At the very least, entire product lines should be considered. For example, if a firm provides a speaker phone, the firm should be able to provide a similar telephone without the speaker phone capabilities and remain in compliance with any rules adopted under Section 255. Similarly, the reasonable availability of product alternatives should remove the need for a manufacturer's product line to meet a specific need. For example, many vendors already supply speaker phones. There is no need for a requirement that all telephone equipment manufacturers supply speaker phones.

If a firm claims that lack of market demand makes providing a specific product not readily achievable, the burden of proof should be on any complainants to show that market demand exists. Further, such a showing should be held to a high standard of proof.

Equipment manufacturers should be able to demonstrate compliance with Section 255 for consumer products by:

- Accessible labeling, packaging and marketing of all products;
- Having in place a training program that assures that design engineers are familiar with the principles of accessible designs, with the needs of people with disabilities, and existing with solutions for disability needs; and
- Making a practice of including members of the disability community in their market research and product development research.[33]

[33] Such a practice should not be read to require involvement of the disability community in every product development effort. Rather, the firm should have in place some program for maintaining knowledge and awareness of the needs of those with disabilities.

Any regulations adopted to implement Section 255 should explicitly recognize the problem of conflict between the needs created by disparate disabilities. Specifically, products containing a feature that benefits people with a specific disability (*e.g.*, a small keyboard) should be exempt from complaints regarding the unsuitability of that feature for other disabilities.

Given the wide variety of software providers and the international marketing of software over the Internet, software products should be excluded from the rules.

D. The FCC's Role In Compliance

Compliance efforts under the proposed Guidelines are likely to be focused primarily on documentation of good-faith efforts to incorporate accessibility features and to justify inability to achieve mandated results in terms of their being not readily achievable for various technical and economic reasons. Under this approach, a supplier's ability to pass muster is largely reckoned in terms of its ability to demonstrate that it strove mightily, notwithstanding any failures to produce tangible results, and its ability to present convincing analysis rationalizing the decisions it has made to an external observer.

In our view, compliance should instead primarily be reckoned in terms of results rather than efforts expended, which is not to say that effort does not provide a reasonable measure of good faith. The issues presented by the accessibility provisions of the Telecommunications Act appear to lend themselves to an approach in which the FCC supplies a clearinghouse for exchanges of relevant information and differing views and serves as an ombudsman, pointing the way and pushing for workable solutions. This is a role the Commission has successfully performed in other similar venues with salutary results.

E. The FCC as Market Monitor

In the late 1980s, the FCC was confronted with a problem that was less complex and certainly less serious than the unmet needs of persons with disabilities,[34] but was similar in some relevant respects to the problem it now faces in ensuring achievement of the Telecommunication Act's goals of

[34] Which is not to belittle Congressional concerns for the rural consumers affected in this earlier instance.

product and service accessibility for persons with disabilities. At that time, satellite video programmers had begun to scramble their signals electronically, thereby preventing persons with home satellite dishes from receiving the transmissions of many popular cable network program services that had previously been available for the taking. Satellite dish owners typically reside in rural areas where over-the-air viewing options are often limited and cable television systems have not been installed because it is uneconomic to do so given low population densities. By installing home satellite dishes, consumers in these areas were able to receive the signals of satellite programmers that were being transmitted to cable systems for local distribution elsewhere and, thereby, to alleviate their reception difficulties.

Rural interests are well represented in Congress, and satellite signal scrambling resulted in significant expressions of Congressional concern about the plight of satellite dish owners, who had typically invested substantial amounts to install their home dishes but then found themselves largely bereft of programming with the onset of signal scrambling. Persons who reside in rural areas rely heavily upon various communications services to maintain effective links to the societal mainstream, and communications services supply important means by which these people are integrated with the broader community. In this context, Congress wanted to ensure that these consumers had access to economically priced signal decoders capable of decrypting encoded satellite signals as well as competitively priced program packages offering a full range of program services.

In passing the Satellite Home Viewer Act, Congress called on the FCC to assume an important oversight function, in particular, to monitor the evolution and performance of the fledgling markets for decoder equipment and multichannel video program packages, to identify any problem areas that might develop, and to troubleshoot when remedial actions were needed. In short, the Commission was assigned the task of following this particular set of problems and ensuring that matters were resolved satisfactorily from the standpoint of the initially adversely affected population. To this end, the Commission was specifically charged with preparing a series of annual status reports to describe evolving conditions in the marketplace, identify any specific problems that were developing, and evaluate the prospects for solutions. In so doing, the Commission would serve as a clearinghouse for relevant technical and commercial information, could help clarify confused circumstances and

establish what was actually transpiring in the marketplace, and could proselytize for implementation of effective remedies for specific problems.

To complete the analogy, in this case Congress was concerned with the marketplace's ability to meet the *signal* accessibility needs of persons with *signal reception* disabilities resulting from the instigation of signal scrambling combined with technical and economic constraints arising for reasons of geography, topography, and circumstances that had changed quickly. The technical and marketplace means to address these needs were not givens — there were significant questions and uncertainties about decoder technology, the ability of suppliers to ramp up production rapidly and meet demands for decryption capabilities in timely fashion, and the pricing and availability of attractive program packages. These matters were eventually successfully resolved. With the Commission *exposing* problems and missteps in some areas and *disclosing* successful attempts to cope in others, marketplace solutions were developed, implemented, and made available to consumers in fairly short order. Efficient decryption technology was perfected, and a plethora of program packages were brought to market. Today living in a rural area no longer carries with it any associated disadvantages in terms of access (albeit at a price) to a full range of multichannel video program options.

F. FCC Role in Fostering Accessibility Improvements

The accessibility provisions of the Telecommunications Act have put equipment suppliers on notice that they must address the accessibility needs of persons with disabilities. The process of developing accessibility guidelines has sensitized suppliers to the specific kinds of accessibility needs that need to be addressed and, in some instances, has broadly pointed the way toward technical fixes that might offer promise in meeting specific accessibility needs in some types of devices.

Obviously, much work remains to be done. In many cases, new technical means of addressing needs must be conceived, training programs need to be created and executed, relevant market research needs to be undertaken, new testing procedures must be developed and refined, and reasonable standards for economic feasibility need to be agreed upon. In this kind of environment, in which there is a considerable technical and economic uncertainty and significant expenditures of time and

other resources are needed to begin to make progress, there is a clear role for the government to play in providing a forum for relevant consumers and producers to establish priorities, set a series of interim objectives, and settle upon acceptable approaches to making needed product improvements.

In our view, it would make good sense for the Commission, as it has done in previous cases, to undertake periodic inquiries into the marketplace's performance in addressing the accessibility needs of persons with handicaps. The Commission should undertake such inquiries with a view toward issuing periodic status reports detailing the nature and extent of compliance efforts and identifying areas in which progress is being made and areas in which more intensive efforts are needed. Serving as an information clearinghouse, the Commission could identify needs and set priorities, thereby helping to ensure that compliance efforts are focused where payoffs are likely to be greatest and accessibility benefits are maximized. It could provide a vehicle for organizing collaborative efforts to perfect and implement accessibility solutions, standardized testing procedures, and technical equipment specifications. It could offer a forum in which conflicting views and claims are exchanged and held up to public scrutiny. In this manner, the Commission could serve as a governmental ombudsman and as a catalyst, hopefully pushing matters toward a successful resolution. In contrast, attempting to enforce detailed proscriptions of equipment design and construction would likely prove to be a regulatory morass.

The instant setting is *not* one in which answers are known and it is simply a matter of implementing them in those cases in which it cannot be demonstrated to be uneconomic to do so. This is an area where the questions posed are highly complex and the answers are rarely likely to be simple, almost always involving the optimization of difficult economic and technical tradeoffs among conflicting design objectives. Indeed, any simple answer is almost certainly going to be wrong. In this regard, requiring that every product be engineered to meet every need is surely an answer *only* in the abstract.

Practical solutions are inevitably going to embody incremental improvements that address only a subset of the universe of accessibility needs. Even if it were feasible to conceive and create products that simultaneously address all accessibility needs, the costs of producing such products would likely

place them far beyond the wherewithal of even the most wealthy of persons with disabilities. Indeed, such products would likely exceed the willingness to pay of most consumers. It serves little purpose to adopt an approach that has little chance of succeeding, but whose pursuit would entail high compliance costs and the stifling of an economic innovative process that has historically been the principal source of improvements in accessibility for persons both with and without disabilities.

Appendix

Project Design Cost Model

As part of this project, a spreadsheet model was developed to allow checking the calculation of the level of affected R&D efforts. This model considered four different sizes of product design efforts and ranges of levels of effort were estimated for each of the four classes. The four classes of projects were:

A. Simple repackaging of products such as telephones or modems,
B. New models of products such as telephones or modems,
C. Developing next generation of phones or modems or upgrading a major product such as a telephone switch, and
D. Developing major new technology platforms such as a new generation PCS system.

An estimate of the proportion of product design efforts that fell into each of the four classes was developed along with an estimate of the total number of product design projects. We also estimated the fraction that complying with the Guidelines would increase the effort at each of the four stages. Those estimates were: research — 5 percent, specification and design — 5 percent, prototype to manufacturing — 8 percent, and manufacturing startup — 1 percent. The tables below show the calculations from this model.

	Program Type														
	A			B			C			D			Average		
% MIX:	31.0			48.8			20.0			.2			100 *		
		Months			Months			Months			Months			Months	
Function	HC	Min	Max	HC	Min	Max	HC	Min	Max	HC	Min	Max	HC	Min	Max
Research	2	0.5	1	4	1	3	10	3	6	20	6	12	5	1.3	3
Specs/Design	3	1	2	6	3	8	20	10	18	100	18	24	8	3.8	8.17
Proto to Manuf	3	1	5	6	5	10	20	18	24	100	24	36	8	6.4	11.3
Manuf Startup	6	1	2	10	2	8	30	6	12	160	12	24	13	2.5	6.97
Total		3.5	10		11	29		37	60		60	96		14	29.4

Note: HCY stands for head-count year.

Total Industry Development Cost ($M)					
	Program Type				
	A	B	C	D	Total
Program Number:	2015	3172	1300	13	6500
Minimum HCY	2,183	19,032	83,417	6,760	111,392
Maximum HCY	5,877	52,867	136,500	10,920	206,164
Minimum $	$164	$1,427	$6,256	$507	$8,354
Maximum $	$441	$3,965	$10,238	$819	$15,462

Function	Expected Cost Increase to Comply with Guidelines
Research	5%
Specs/Design	5%
Proto to Manuf	8%
Manuf Startup	1%

Total Industry Compliance Cost ($M)					
	Program Type				
	A	B	C	D	Total
Program Number:	2015	3172	1300	13	6500
Minimum HCY	84	978	4,561	333	5,956
Maximum HCY	289	2,273	6,825	497	9,884
Minimum $	$6	$73	$342	$25	$447
Maximum $	$22	$170	$512	$37	$741

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Telecommunications Industry Association

Proposal for FCC Guidelines
for
Implementing Section 255 of the Communications Act

Discussion Draft

December 10, 1997

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Implementation of Section 255 of the Communications Act
Guidelines for Equipment Manufacturers

1. General.

Manufacturer guidelines for access by persons with disabilities to telecommunications equipment and customer premises equipment.

(a) *Definitions.*

(1) *Accessible*: Telecommunications equipment and customer premises equipment is accessible when it can be used by individuals with disabilities in its standard manufactured and shipped form without having to modify the product or purchase other equipment.

(2) *Compatible*: Customer premises equipment ("CPE") and telecommunications equipment is compatible if it conforms with a compatibility interface standard adopted by an accredited voluntary consensus standards body, as described in Paragraph 8, for the interconnection of such equipment with peripheral devices or specialized CPE commonly used by individuals with disabilities to achieve access.

(3) *Manufacturer*: A manufacturer of telecommunications equipment or CPE is the division, business unit, subsidiary, or other business entity that is responsible for introducing, directly or through distribution arrangements, related telecommunications equipment or CPE into the United States marketplace in its final form or has direct control over the design and development, fabrication, and costs and expenses associated with such products.

(4) *Disability*: As applied to telecommunications equipment or customer premises equipment, disability means a current limitation affecting hearing, vision, movement, manipulation, speech, or interpretation of information which substantially limits the use of telecommunications equipment, customer premises equipment, or telecommunications services.

(5) *Readily achievable*: As applied to telecommunications equipment and CPE, an action by a manufacturer to make telecommunications equipment or CPE accessible, usable, or compatible is readily achievable if it:

(i) Is technically feasible at the time design or development activities for the telecommunications equipment or CPE commences;

(ii) Does not add much to the expense of designing or developing the telecommunications equipment or CPE or to the cost or expense of manufacturing or marketing its telecommunications equipment or CPE;

(iii) Does not add much to the time required to design or develop its telecommunications equipment or CPE;

(iv) Does not involve altering a fundamental or essential characteristic of the telecommunications equipment or CPE;

(v) Would not significantly limit the usefulness, marketability, or volume of sales of the telecommunications or CPE; and

(vi) is not inconsistent with an existing FCC regulation, technical specification or requirement, or stated policy goal and does not conflict with other applicable interface standards as described in Paragraph 8.

2. Accessibility and compatibility of telecommunications equipment and customer premises equipment.

(a) *General.* A manufacturer of telecommunications equipment or CPE shall ensure that the equipment is designed, developed, and fabricated to be accessible to and usable by individuals with disabilities, if readily achievable. Whenever such accessibility and usability is not readily achievable, such manufacturer shall ensure that the equipment is compatible with existing peripheral devices or specialized CPE commonly used by individuals with disabilities to achieve access, if readily achievable.

(b) *Ongoing obligation.* The obligation to evaluate the accessibility of telecommunications equipment and CPE is an ongoing obligation that must be accomplished at the beginning of the design and development process for new telecommunications equipment and CPE and upgrades of existing telecommunications equipment and CPE which materially affect the functionality of the equipment.

(c) *Manufacturer's discretion.* These Guidelines recognize that there will be cases where manufacturers may not be able to achieve the creation of a single product that addresses accessibility for all, or some, combinations or degrees of disabilities. Therefore, manufacturers have reasonable discretion in choosing among those accessibility features to be incorporated into telecommunications equipment and CPE. Notwithstanding the foregoing, manufacturers should consider incorporating into another comparable product, an access feature or features not addressed in other products. Manufacturers shall make good faith efforts to address the limitations which affect the use of telecommunications equipment and CPE by persons with disabilities.

3. General guidelines for manufacturers.

(a) *Adoption of a process to ensure accessibility and compatibility.*

(1) No later than twelve months following the effective date of these Guidelines, each manufacturer of telecommunications equipment or CPE should adopt a process for accomplishing the goal of enhancing the accessibility and usability of its equipment. Paragraphs 9. and 10. describe those aspects of accessibility and compatibility which manufacturers are expected to consider when evaluating whether it is readily achievable to make telecommunications equipment and CPE accessible or compatible. Third party certification of such a process shall not be required.

(2) Each manufacturer may adopt a process that is most consistent with its unique organizational and management structure, provided that the process, at a minimum, will:

(i) Identify barriers to the accessibility of the manufacturer's telecommunications equipment or CPE resulting from the limitations constituting a disability;

(ii) Disseminate information about accessibility needs and barriers to employees and others involved in the equipment design and development processes;

(iii) Consider accessibility early in the design and development processes; and

(iv) Evaluate designs to remove barriers to accessibility or to enhance the accessibility of telecommunications equipment or CPE.

(3) Each manufacturer shall incorporate into its products those designs to increase accessibility identified by its processes to the extent that it is readily achievable to do so. When designs to remove barriers to accessibility are not readily achievable, manufacturers shall:

(i) Identify applicable interface standards, adopted in accordance with Paragraph 8., governing the connection of telecommunications equipment or CPE with existing peripheral devices or specialized customer premises equipment; and

(ii) Ensure compatibility with such standards, to the extent that it is readily achievable to do so.

(b) *Adoption of measures to ensure usability.*

(1) No later than twelve months following the effective date of the Guidelines, each manufacturer shall adopt measures to ensure that individuals with disabilities are provided with usable information and documentation about its telecommunications equipment and CPE, if readily achievable. For purposes of these Guidelines, usable information and documentation shall include user guides or instructions, installation instructions for end-user installable devices, and other product support communications, including but not limited to call centers.

(2) To the extent that it is readily achievable to do so, information and documentation referred to in Paragraph 3. (b) (1):

(i) Should include information about accessibility and compatibility features;

(ii) Should be generally equivalent to information provided to similarly situated individuals without disabilities;